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NATIONAL DAM INSPECTION PROGRAM. STONE LAKE DAM (NDI I.D. PA-00--ETC(U)
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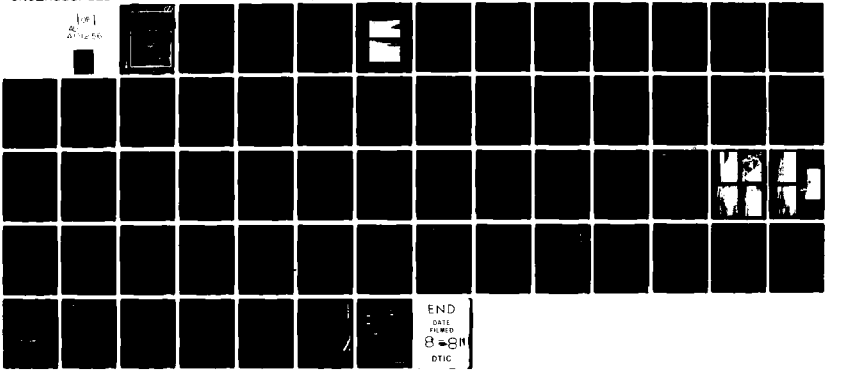

LEVEL II

SUSQUEHANNA RIVER BASIN
STONESTREET CREEK, SUSQUEHANNA COUNTY

PENNSYLVANIA

(6) National Dam Inspection Program.
STONE LAKE DAM
(NDI I.D. PA-00055,
DER I.D. 058-129), Susquehanna
[redacted]
River Basin, Stonestreet Creek, Susquehanna County,
Pennsylvania. PHASE I INSPECTION REPORT,
NATIONAL DAM INSPECTION PROGRAM

"Original contains color plates: All DTIC reproductions will be in black and white"

(12) 61

(11) 1981

(10) Lawrence D. Andersen
PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY

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10 DUFF ROAD
PITTSBURGH, PA. 15235

(15) Contract DACW31-81-C-0044

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigations and analyses involving topographic mapping, subsurface investigations, material testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the inspection is intended to identify any need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The assessment of the conditions and recommendations was made by the consulting engineer in accordance with generally and currently accepted engineering principles and practices.

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Stone Lake Dam
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Susquehanna
STREAM: Stonestreet Creek, tributary of Middle Branch of Wyalusing Creek
SIZE CLASSIFICATION: Small
HAZARD CLASSIFICATION: Significant
OWNER: Mr. Courtland Birchard
DATE OF INSPECTION: March 24, 1981 and April 30, 1981

ASSESSMENT: Based on the evaluation of the existing conditions, the condition of Stone Lake Dam is considered to be good. At this time, no conditions were observed that would significantly affect the overall performance of the structure.

The spillway capacity was evaluated according to the recommended procedures and was found to pass the required spillway design flood of 50 percent of the PMF. Therefore, the spillway capacity is rated as adequate.

The following recommendations should be implemented immediately or on a continuing basis.

1. The owner should confirm the operational condition of the outlet pipe valve and perform maintenance, if required. The need for providing an upstream control to the outlet pipe should be evaluated.

2. The swampy area below the toe of the dam should be periodically observed and necessary remedial work should be performed if seepage conditions develop.

3. The barbed wire fence across the right abutment emergency spillway should be relocated sufficiently away from the flow control section to prevent possible blockage of the channel by debris.

4. Around-the-clock surveillance should be provided during unusually heavy runoff and a formal warning system should be developed to alert the downstream residents in the event of an emergency.

5. The dam and appurtenant structures should be inspected regularly and necessary maintenance should be performed.

Assessment - Stone Lake Dam

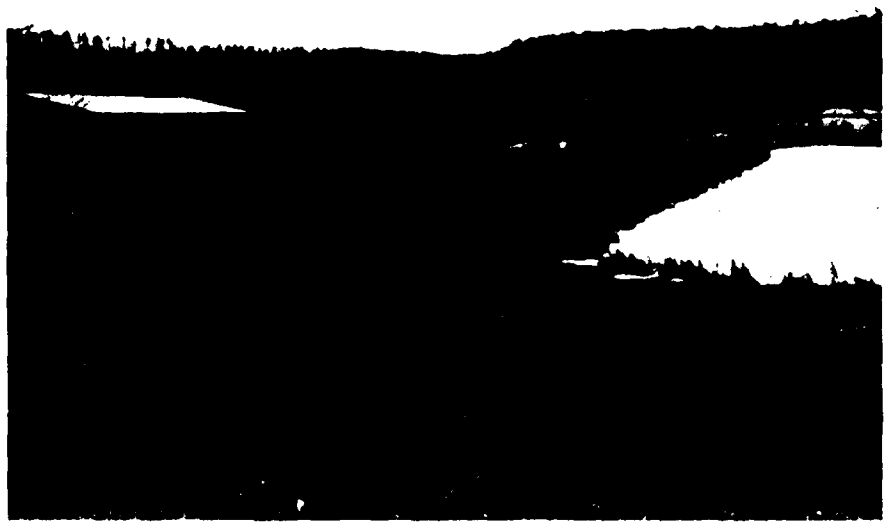
Lawrence D. Andersen, P.E.
Vice President

June 1, 1981
Date

Approved by:

JAMES W. PECK
Colonel, Corps of Engineers
Commander and District Engineer

17 June 1981
Date:



Upstream Face

Downstream Face

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(Continued)

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
STONE LAKE DAM
NDI I.D. PA-0055
DER I.D. 058-129

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. The inspection was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose. The purpose of this inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances. Stone Lake Dam consists of an earth embankment approximately 500 feet long with a maximum height of 21 feet from the downstream toe and a crest width of 12 feet. Both the upstream and downstream slopes of the dam are covered with grass and are 2.5H:1V. The flood discharge facilities for the dam consist of a drop inlet type primary spillway located near the center of the dam and two trapezoidal earth channel emergency spillways on both abutments. The design drawing indicates that the low level outlet facilities consist of an eight-inch pipe extending through the embankment along the original stream bed and terminating at the downstream toe of the dam. Flow through the pipe is controlled by a valve near the downstream end. Only the outlet valve chamber is visible.

b. Location. Stone Lake Dam is located on Stonestreet Creek, approximately three miles upstream of its confluence with Middle Branch of Wyalusing Creek in Forest Lake Township, Susquehanna County, Pennsylvania (N41° 52.8', W76° 2.1'). Plate 1 illustrates the location of the dam.

c. Size Classification. Small (based on 21-foot height and approximately 160 acre-feet maximum storage capacity).

d. Hazard Classification. The dam is classified to be in the significant hazard category. Downstream from the dam, Stonestreet Creek flows through a wide, essentially uninhabited valley for approximately three miles from the dam and joins the Middle Branch of Wyalusing Creek. One farmhouse, located one mile from the dam along Stonestreet Creek, and two houses near the confluence with the Middle Branch constitute the

main impact area of a flood in the event of a dam failure. It is estimated that State Route 267 would also be damaged due to a dam failure. Failure of the dam would probably cause loss of a few lives and property damage in this area.

e. Ownership. Mr. Courtland Birchard, R.D. #5, Box 113, Montrose, Pennsylvania 18801.

f. Purpose of Dam. Recreation and conservation.

g. Design and Construction History. The dam was designed in 1961 by the U.S. Department of Agriculture, Soil Conservation Service, Susquehanna County office. The dam was completed in 1962.

h. Normal Operating Procedure. The reservoir is normally maintained at Elevation 1432, the uncontrolled primary spillway crest elevation, leaving 6.3 feet of freeboard to the low spot of the dam at Elevation 1438.3. Inflow occurring when the lake level is at or above primary spillway level is discharged through the drop inlet spillway up to Elevation 1433.5 and through the emergency spillway when above Elevation 1433.5.

1.3 Pertinent Data. Elevations referred to in this and subsequent sections of the report were calculated based on approximate field measurements, assuming the primary spillway crest to be at Elevation 1432 (USGS Datum), which is the elevation shown as the normal pool elevation on the USGS 7.5-minute Friendsville quadrangle. Elevations shown on the design drawings appear to be relative to an arbitrary site datum.

a. Drainage Area	0.58 square mile[1]
b. Discharge at Dam Site (cfs)	
Maximum known flood at dam site	Unknown
Outlet conduit at maximum pool	Unknown
Gated spillway capacity at maximum pool	Not applicable
Ungated spillway capacity at maximum pool	1446
Total spillway capacity at maximum pool	1446
c. Elevation (USGS Datum) (feet)	
Top of dam	1439.2 (as designed) 1438.3 (measured low spot)
Maximum pool	1438.3
Normal pool	1432
Upstream invert outlet works	1422[2]

[1] Planimetered from USGS topographic map. State files indicate the same drainage.

[2] Based on design drawing.

Downstream invert (primary spillway)	1425.3
Maximum tailwater	Unknown
Toe of dam	1417.6

d. Reservoir Length (feet)

Normal pool level	1600
Maximum pool level	1800±

e. Storage (acre-feet)

Normal pool level	33
Maximum pool level	160

f. Reservoir Surface (acres)

Normal pool level	16±
Maximum pool level	24±

g. Dam

Type	Earth embankment
Length	500 feet
Height	21 feet
Top width	12 feet
Side slopes	Downstream: 2.5H:1V; (measured)[3] Upstream: 2.5H:1V (measured)[3]
Zoning	No
Impervious core	No
Cutoff	No
Grout curtain	No

h. Regulating Outlet

Type	8-inch steel pipe
Length	130± feet
Closure	Downstream valve chamber
Access	Downstream toe
Regulating facilities	Downstream valve

[3]Design slopes 3H:1V.

i. Spillway	Primary:	Emergency:
Type	Drop inlet	Two trapezoidal earth channels
Length	8± foot perimeter	25 feet (each)
Crest elevation	1432	1433.5 (4)
Upstream channel	Lake	Lake
Downstream channel	Two-foot-diameter reinforced concrete pipe and earth channel	Earth channel

(4) Measured spillway crest. State files indicate the crest elevation to be 1435.6 or 3.6 feet above the normal pool Elevation 1432.

SECTION 2
DESIGN DATA

2.1 Design

a. Data Available. The available data consist of files provided by the Commonwealth of Pennsylvania, Department of Environmental Resources (PennDER), which contain design drawings, correspondence, and inspection photographs and reports.

(1) Hydrology and Hydraulics. The available information includes the design capacity of the spillway, reservoir storage volume, watershed area and hydrology calculations.

(2) Embankment. The available information consists of various design drawings and past state inspection reports.

(3) Appurtenant Structures. The available information consists of design drawings.

b. Design Features

(1) Embankment. Plate 2 illustrates the plan of the embankment and the reservoir. As illustrated in Plate 3, the dam is a homogeneous embankment designed to have a 3:1 (horizontal to vertical) slope on both the downstream and upstream slopes and a crest width of 12 feet. The upstream face was to be protected with riprap extending two feet above and two feet below the normal pool level (Elevation 1432).

(2) Appurtenant Structures. The appurtenant structures of the dam consist of primary and emergency spillways and the outlet works as shown on Plates 2 and 3. The primary spillway is comprised of a 30-inch-diameter reinforced concrete drop inlet structure at Elevation 1432, discharging into a 24-inch-diameter reinforced concrete pipe through the dam which terminates at the downstream toe. One antiseep collar was provided along the pipe. The design drawings indicate that the upstream end of the pipe is equipped with a reinforced concrete base to serve as a foundation for the drop inlet structure. The emergency spillway discharge channels are trapezoidal earth channels with a base width of 25 feet. The control section of the primary spillway is located at a level 3.6 feet above the primary spillway invert.

The design drawings indicate that the low level outlet facility for the dam consists of an eight-inch steel pipe equipped with a gate valve near the downstream end.

c. Design Data

(1) Hydrology and Hydraulics. A Commonwealth of Pennsylvania report entitled "Report Upon the Application of Carlton E. Birchard,"

dated July 6, 1961, indicates that the capacity of the emergency spillway meets the state's "C" curve criteria. Further, it was noted that sufficient storage was provided between normal pool and emergency spillway crest to store runoff from a 10-year flood.

(2) Embankment. Available information indicates that a material investigation consisting of excavation of test pits and borings were performed by the U.S. Department of Agriculture, Soil Conservation Service. A subsurface profile is shown on Plate 3. No reference was found to indicate whether any engineering analyses, such as slope stability or seepage analyses, were performed based on the results of the soils investigation.

(3) Appurtenant Structures. No design calculations are available for the appurtenant structures.

2.2 Construction. In general, the construction of the dam was apparently conducted in accordance with the drawings and specifications. Based on visual observations, two changes were noted: (1) Riprap called for on the upstream face has not been provided, and (2) Location of the primary spillway was changed from an area near the left abutment to a location right of the center of the dam.

No reports were found to indicate any major postconstruction change of the dam structure.

2.3 Operation. There are no formal operating records maintained for the dam. The normal reservoir water level is maintained by discharge through the primary spillway.

2.4 Other Investigations. None reported.

2.5 Evaluation

a. Availability. The available information was provided by PennDER.

b. Adequacy

(1) Hydrology and Hydraulics. The available information is not considered to be sufficient to assess the adequacy of the spillways.

(2) Embankment. Other than design drawings and the material investigation study, no other design information is available to determine the adequacy of the design of the dam. The design apparently lacks such considerations as embankment slope stability and seepage analyses and other quantitative data to aid in the assessment of the design.

(3) Appurtenant Structures. Review of the design drawings indicate that the appurtenant structures are designed and constructed in conformance with currently accepted engineering practice.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The onsite inspection of Stone Lake Dam consisted of:

1. Visual inspection of the embankment, abutments, and embankment toe.

2. Visual examination of the spillways and the visible portions of the outlet works.

3. Evaluation of downstream area hazard potential.

The specific observations are illustrated in Plate 4.

b. Embankment. The general inspection of the embankment consisted of searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features.

In general, the condition of the dam is considered to be good. One wet area was observed at the toe of the dam in an area which appears to be the original streambed. No seepage flow appeared to be associated with this area. The downstream face and the crest are covered with grass and found to be adequately maintained.

The dam crest was surveyed relative to the primary spillway crest elevation and was found to have some vertical irregularities. Although the design freeboard for the dam is 7.2 feet, the field survey indicated freeboards ranging from 6.3 feet to 7.2 feet. The lowest area occurred in a section adjacent to the left emergency spillway. The dam crest profile, according to field measurements, is illustrated in Plate 5.

c. Appurtenant Structures. The appurtenant structures were examined for deterioration or other signs of distress and obstructions that would limit flow. In general, the structures were found to be in good condition. The primary spillway drop inlet structure is equipped with grating at the intake which could be vulnerable to blockage by debris. Similarly, a barbed wire fence across the right emergency spillway control section poses some potential for blockage of the channel by debris during storms.

The owner reported that the low level outlet pipe valve has not been operated since the construction of the dam. Operation of the low level outlet pipe valve was not observed.

d. Reservoir Area. A map review indicates that the watershed is predominantly covered by rural farm areas with some wooded areas. No signs of landslide activity were found in the vicinity of the reservoir. A review of the regional geology is included in Appendix F.

e. Downstream Channel. Downstream from the dam, Stonestreet Creek flows approximately three miles where it passes under State Route 267 and then joins the Middle Branch of Wyalusing Creek. A further description of the downstream conditions is included in Section 1.2 d.

3.2 Evaluation. The Stone Lake Dam was found to be in good condition and adequately maintained. The operational condition of the low level outlet pipe was not observed. Therefore, the owner should evaluate the operational condition of the facility.

SECTION 4
OPERATIONAL FEATURES

4.1 Procedure. There are no formal operating procedures for the dam. The reservoir is normally maintained at the uncontrolled spillway crest level with excess inflow discharging over the spillway.

4.2 Maintenance of the Dam. The maintenance of the dam is considered to be good. The crest and slopes of the dam are covered with grass and adequately maintained.

4.3 Maintenance of Operating Facilities. The only operable facility of the dam is the low level outlet pipe valve. The owner reported that the valve was not operated since the construction of the dam. The operational condition of the valve was not observed.

4.4 Warning System. No formal warning system exists for the dam. Telephone communication facilities are available via the owner's residence along the reservoir shoreline.

4.5 Evaluation. The maintenance condition of the dam is considered to be good. The owner should evaluate the operational condition of the low level outlet pipe.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. Stone Lake Dam has a watershed of 0.6 square mile and impounds a reservoir with a surface area of 16 acres at normal pool level. The flood discharge facilities for the dam consist of two 25-foot trapezoidal emergency spillway channels, one located on each abutment, and a drop inlet type primary spillway located near the center of the dam. The combined spillway capacity was estimated to be 1446 cfs, based on 6.3 feet of available freeboard relative to the low spot on the crest of the dam.

b. Experience Data. As previously stated, Stone Lake Dam is classified as a small dam in the significant hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass from the 100-year storm up to one-half PMF. In view of the downstream damage potential, one-half PMF is considered to be applicable to this dam.

The PMF inflow hydrograph for the reservoir was determined utilizing the Dam Safety Version of the HEC-1 computer program developed by the Hydrologic Engineering Center of the U.S. Army, Corps of Engineers. The data used for the computer input are presented in Appendix D. The one-half PMF inflow hydrograph was found to have a peak flow of 910 cfs. The peak flow of the 100-year flood was calculated according to the recommended procedure and was found to be 530 cfs. The computer input, summary of the computer output, and the 100-year flood calculations are included in Appendix D.

c. Visual Observations. On the date of inspection, no conditions were observed that would indicate that the spillway capacity would be significantly reduced in the event of a flood. However, as noted before, a barbed wire fence across the right abutment emergency spillway may pose a potential for blockage of the channel by debris during storms.

d. Overtopping Potential. The available spillway capacity was found to be greater than the 100-year flood peak. Further, various percentages of the PMF inflow hydrograph were routed through the reservoir to determine the percent of PMF inflow that the dam can pass without overtopping the embankment. The computer analyses indicate that the spillway can pass 50 percent PMF without overtopping. This would result in a maximum water surface elevation of 1436.3 within the reservoir, leaving approximately two feet of freeboard to the measured low spot of the dam.

e. Spillway Adequacy. The spillway capacity was found to fulfill the recommended spillway design capacity requirements and is, therefore, classified as adequate.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

(1) Embankment. As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the performance of the structure, and no unsatisfactory conditions have been reported in the past.

(2) Appurtenant Structures. No conditions were observed that would affect the structural performance of appurtenant structures.

b. Design and Construction Data

(1) Embankment. The available design and construction information does not provide any quantitative data to aid in the assessment of stability. However, as previously noted, the field observations did not reveal any signs of distress which would significantly affect the stability of the dam at this time and none were reported in the past. Therefore, based on visual observation, structural stability of the dam is considered to be adequate.

(2) Appurtenant Structures. A review of the design drawings indicates that there are no apparent structural deficiencies that would significantly affect the performance of the appurtenant structures.

c. Operating Records. Not maintained.

d. Postconstruction Changes. There have been no reported postconstruction modifications to the original design that would affect the structural stability of the embankment.

e. Seismic Stability. The dam is located in Seismic Zone 1, and based on visual observations, the static stability of the dam is considered to be adequate. Therefore, based on the recommended criteria for evaluation of seismic stability of dams, the structure is presumed to present no hazard as a result of earthquakes.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations indicate that the condition of Stone Lake Dam is good. At this time, no conditions were observed that would significantly affect the overall performance of the structure.

The spillway capacity was evaluated according to the recommended procedures and was found to pass the required spillway design flood of 50 percent of the PMF. Therefore, the spillway capacity is rated as adequate.

b. Adequacy of Information. The available information, in conjunction with the visual observations, is considered to be sufficient to make a Phase I evaluation.

c. Urgency. The following recommendations should be implemented as soon as possible or on a continuing basis.

d. Necessity for Additional Investigation. No additional investigation is considered to be required at this time.

7.2 Recommendations/Remedial Measures. It is recommended that:

1. The owner should confirm the operational condition of the outlet pipe valve and perform maintenance, if required. The need for providing an upstream control to the outlet pipe should be evaluated.

2. The swampy area below the toe of the dam should be periodically observed and necessary remedial work should be performed if seepage conditions develop.

3. The barbed wire fence across the right abutment emergency spillway should be relocated sufficiently away from the flow control section to prevent possible blockage of the channel by debris.

4. Around-the-clock surveillance should be provided during unusually heavy runoff and a formal warning system should be developed to alert the downstream residents in the event of an emergency.

5. The dam and appurtenant structures should be inspected regularly and necessary maintenance should be performed.

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

NDI: PA-0055

NAME OF DAM Stone Lake COUNTY Susquehanna STATE Pennsylvania ID# DER: 058-129

TYPE OF DAM Earth HAZARD CATEGORY Significant

DATE(S) INSPECTION March 24, 1981 WEATHER Cloudy TEMPERATURE 40

POOL ELEVATION AT TIME OF INSPECTION 1432 M.S.L. TAILWATER AT TIME OF INSPECTION 1417.6 M.S.L.

INSPECTION PERSONNEL:	REVIEW INSPECTION PERSONNEL: (April 30, 1981)
Arthur Smith	Lawrence D. Andersen
Wah-Tak Chan	James H. Poellot
Bilgin Erel	Bilgin Erel

Owner's Representative:

Mr. C. Birchard

Bilgin Erel RECORDER

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	See Plate 5 for dam crest profile. No noticeable horizontal misalignment observed.	
RIPRAP FAILURES	Upstream slope has no shoreline riprap protection.	

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No problems observed.	
ANY NOTICEABLE SEEPAGE	None. A swampy area is located below the toe of the dam. See Plate 4 for location.	This area should be periodically observed to determine if seepage conditions are developing.
STAFF GAGE AND RECORDER	None	
DRAINS	None	

VISUAL INSPECTION
PHASE I
OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Other than a valve chamber on the downstream slope, no portions of the outlet works were visible.	
INTAKE STRUCTURE	Submerged.	
OUTLET STRUCTURE	Downstream end of the outlet pipe could not be located.	The owner should locate the downstream end of the outlet pipe.
OUTLET CHANNEL	Earth channel.	
EMERGENCY GATE	Located in a valve chamber on the downstream face of the dam. Operational condition of the valve was not observed.	The owner should confirm the operational condition of the outlet pipe valve.

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	The emergency spillway is an earth channel.	
APPROACH CHANNEL	No problems observed.	
DISCHARGE CHANNEL	In good condition. No obstruction on the left emergency spillway channel.	
BRIDGE AND PIERS	None. A barbed wire fence across the right abutment spillway is considered to pose a potential for blockage of the channel by debris during floods.	The fence should be relocated away from the control section of the spillway.

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	The dam has no gated spillway.	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

VISUAL INSPECTION
PHASE I
INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

VISUAL INSPECTION
PHASE I
RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	No problems observed.	
SEDIMENTATION	Unknown	
UPSTREAM RESERVOIRS	A two- to four-acre pond immediately upstream of the reservoir.	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No problems observed.	
SLOPES	No problems observed.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	One farm located one mile downstream. (Population estimated at four.)	

APPENDIX B

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
AND HYDROLOGIC AND HYDRAULIC
PHASE I

APPENDIX B

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Stone Lake

ID# NDI: PA-0055
DER: 058-129

ITEM	REMARKS
AS-BUILT DRAWINGS	The design drawings are available in state files.
REGIONAL VICINITY MAP	See Plate 1.
CONSTRUCTION HISTORY	The dam was designed by the Soil Conservation Service in 1961; construction was completed in 1962.
TYPICAL SECTIONS OF DAM	See Plate 3.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See Plate 2.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	Not available.
DESIGN REPORTS	A state report entitled "Report Upon the Application of Carlton E. Birchard," dated July 6, 1961.
GEOLOGY REPORTS	Not available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Hydrology and hydraulics analysis are available in state files. Stability and seepage analysis are not included.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	See Plate 3 for subsurface profile and material classification.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	None reported.
BORROW SOURCES	Unknown
MONITORING SYSTEMS	None
MODIFICATIONS	None
HIGH POOL RECORDS	According to the owner, Mr. Courtland Birchard, two feet of water flowed through both emergency spillways during tropical storm Agnes in 1972.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None reported.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	Not maintained.
SPILLWAY PLAN SECTIONS DETAILS	See Plate 3.
OPERATING EQUIPMENT PLANS AND DETAILS	See Plate 3.

CHECKLIST
ENGINEERING DATA
HYDROLOGIC AND HYDRAULIC

DRAINAGE AREA CHARACTERISTICS: 0.58 square mile (partially wooded and pastureland)

ELEVATION, TOP OF NORMAL POOL AND STORAGE CAPACITY: 1432 (33 acre-feet)

ELEVATION, TOP OF FLOOD CONTROL POOL AND STORAGE CAPACITY: 1438.3 (approximately 160 acre-feet)

ELEVATION, MAXIMUM DESIGN POOL: 1439.2 (design top of dam)

ELEVATION, TOP OF DAM: 1438.3 (low spot)

SPILLWAY:

a. Elevation 1432 (primary); 1433.5 (emergency)

b. Type 24-inch-diameter reinforced concrete pipe with 30-inch-diameter reinforced concrete pipe riser (primary), trap. emergency

c. Width Two 25-foot trap. emergency spillway with 3:1 side slope

d. Length Approximately 100 feet at 2 percent slope

e. Location Spillover Both ends of dam

f. Number and Type of Gates None

OUTLET WORKS:

a. Type 8-inch-diameter steel pipe

b. Location Near left abutment

c. Entrance Inverts 1422 (estimated)

d. Exit Inverts 1420 (estimated) (downstream end not located)

e. Emergency Drawdown Facilities 8-inch steel pipe

HYDROMETEOROLOGICAL GAGES:

a. Type None

b. Location N/A

c. Records None

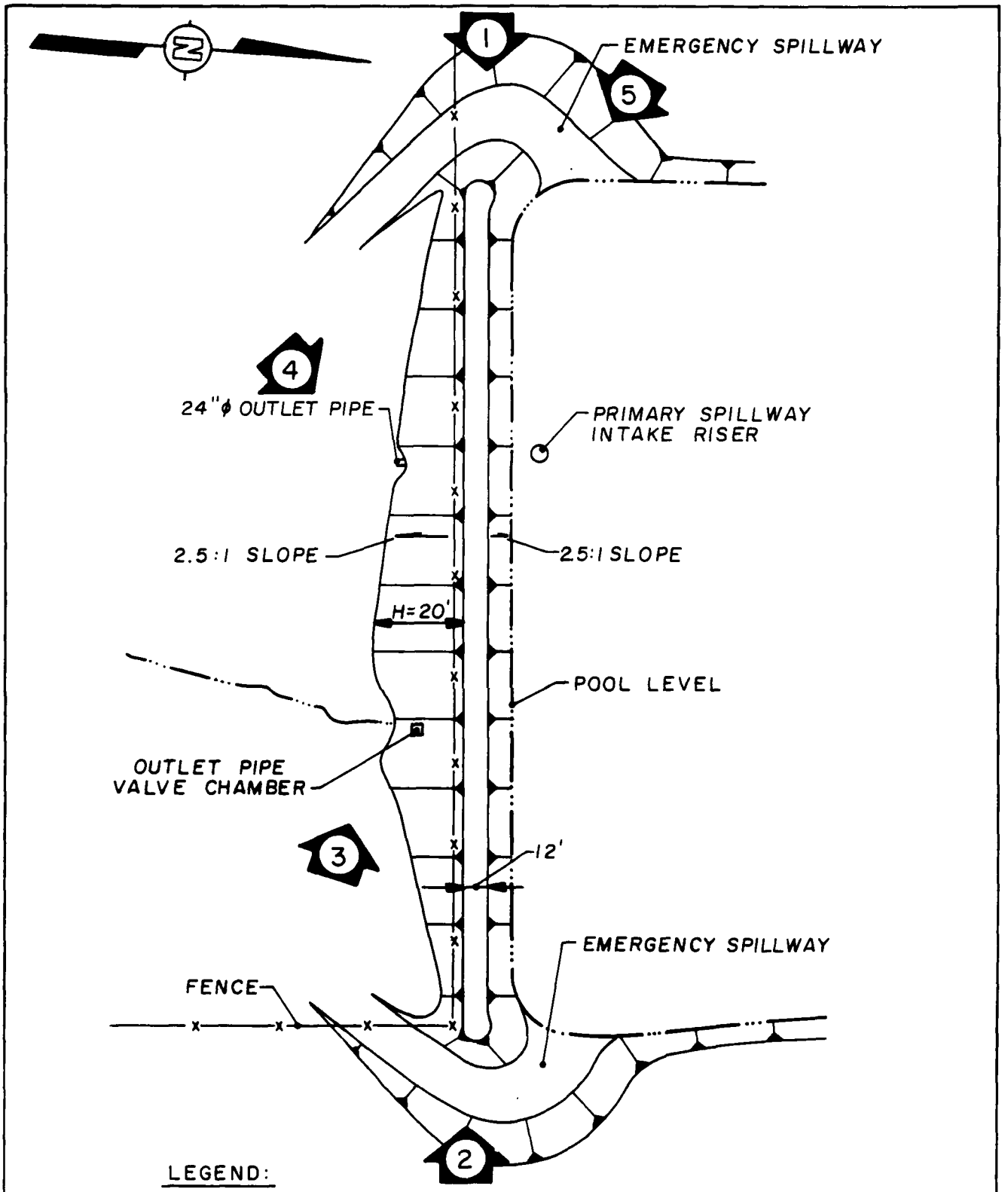
MAXIMUM NONDAMAGING DISCHARGE: Approximately 470 cfs in 1972 (estimated based on 2-foot water depth and 50-foot channel width)

APPENDIX C

PHOTOGRAPHS

LIST OF PHOTOGRAPHS
STONE LAKE DAM
NDI I.D. NO. PA-0055
MARCH 24, 1981

PHOTOGRAPH NO.	DESCRIPTION
1	Dam crest (looking east).
2	Dam crest (looking west).
3	Downstream face.
4	24-inch-diameter outlet pipe.
5	Upstream face (note emergency spillway channel at foreground).
6	A house and a barn along Stonestreet Creek (approximately 1.0 mile downstream from dam).
7	A house along Stonestreet Creek near State Route 267 underpass (approximately 3.0 miles downstream from dam).



LEGEND:

2 INDICATES DIRECTION IN WHICH PHOTOGRAPH WAS TAKEN

STONE LAKE DAM
KEY PLAN OF PHOTOGRAPHS
FIELD INSPECTION DATE: MAR. 24, 1981

DAPTOLONIA

NOT TO SCALE

PHOTOGRAPH NO 1

PHOTOGRAPH NO 2

PHOTOGRAPH NO 3

PHOTOGRAPH NO 4

PHOTOGRAPH NO 5

PHOTOGRAPH NO. 6

PHOTOGRAPH NO 7

APPENDIX D

HYDROLOGY AND HYDRAULICS ANALYSES

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: Stone Lake Dam

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.2 INCHES/24 HOURS

STATION	1	2	3	4	5
Station Description	Stone Lake	Dam			
Drainage Area (square miles)	0.58	-			
Cumulative Drainage Area (square miles)	0.58	0.58			
Adjustment of PMF for Drainage Area (%)[1]	95%				
6 Hours	117	-			
12 Hours	127	-			
24 Hours	136	-			
48 Hours	142	-			
72 Hours	145	-			
Snyder Hydrograph Parameters					
Zone[2]	11	-			
C_p/C_t[3]	0.62/1.50	-			
L (miles)[4]	0.85	-			
L_{ca} (miles)[4]	0.40	-			
$t_p = C_t(L \cdot L_{ca})^{0.3}$ (hours)	1.08	-			
Spillway Data		Primary / Emergency			
Crest Length (ft)	-	7 / 50			
Freeboard (ft)	-	6.3 / 4.8			
Discharge Coefficient	-	3.2 / 2.65			
Exponent	-	1.5 / 1.5			

(1) Hydrometeorological Report 40, U.S. Weather Bureau, 1965.
(2) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).
(3) Snyder's Coefficients.
(4) L = Length of longest water course from outlet to basin divide.
L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

STORAGE VS. ELEVATION

ELEVATION	ΔH, FEET	AREA (acres)[1]	ΔVOLUME (acre-feet)	STORAGE (acre-feet)[2]
1432		16.3		33.0
	-			
1434		18.5		-
	-			
1436		21.4		-
	-			
1438		24.0		160.0
1440	2	25.3		-

(1) From DER files, SCS calculations.
(2) Volume per HEC-1 computer run.

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  01 APR 80
**********
    1                 A1       SNYDER UNIT HYDROGRAPH, SPILLWAY AND DAM OVERTOPING ANALYSES
    2                 A2       STONE LAKE DAM, (DER 58-129), SUSQUEHENNA COUNTY, PA.   PROJECT NO 80-556-18
    3                 A3       FOR 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, AND 100% PROBABLE MAXIMUM FLOOD(PMF)
    4                 B    300         0        15         0         0         0         0         0        -4         0
    5                 B1     5
    6                 J      1         9         1
    7                 J1  0.20      0.30      0.40      0.50      0.60      0.70      0.80      0.90      1.00
    8                 K      0         1                                              1
    9                 K1       CALCULATION OF SNYDER INFLOW HYDROGRAPH TO STONE LAKE DAM, (DER 58-129)
   10                 M      1         1      0.58                 0.58                                    1
   11                 P               21.1       117       127       136       142       145
   12                 T                                                              1.0       0.5            0.0446
   13                 W   1.08      0.62
   14                 X   -1.5     -0.05       2.0
   15                 K      1         2                                              1
   16                 K1       ROUTING FLOW THROUGH STONE LAKE DAM, (DER 58-129)
   17                 Y                                          1         1
   18                 Y1     1                                                   -1432.0
   19                 $A    0.0      16.3      18.5      21.4      24.0      25.3
   20                 $E1426.0    1432.0    1434.0    1436.0    1438.0    1440.0
   21                 $$1433.5      50.0      2.65       1.5    1426.3       0.6      3.14       0.5
   22                 $D1438.3      2.65       1.5     500.0
   23                 $L   25.0      50.0     125.0     300.0     400.0     500.0
   24                 $V1438.3    1438.6    1438.7    1438.8    1439.0    1439.2
   25                 K     99
```

COMPUTER INPUT
OVERTOPPING ANALYSIS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1 .20	RATIO 2 .30	RATIO 3 .40	RATIO 4 .50	RATIO 5 .60	RATIO 6 .70	RATIO 7 .80	RATIO 8 .90	RATIO 9 1.00
HYDROGRAPH AT	1	58	1	363.	545.	726.	908.	1089.	1271.	1452.	1634.	1815.
	(	1.50)	(	10.28)(	15.42)(	20.56)(	25.70)(	30.84)(	35.98)(	41.12)(	46.26)(	51.41)
ROUTED TO	2	58	1	121.	300.	477.	652.	828.	995.	1159.	1325.	1493.
	(	1.50)	(	3.43)(	8.48)(	13.51)(	18.47)(	23.44)(	28.18)(	32.81)(	37.53)(	42.26)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1432.00	1433.50	1438.30
STORAGE	33.	58.	160.
OUTFLOW	36.	41.	1446.

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1434.21	0.00	71.	121.	0.00	43.00	0.00
.30	1435.05	0.00	88.	300.	0.00	42.25	0.00
.40	1435.69	0.00	101.	477.	0.00	41.75	0.00
.50	1436.25	0.00	113.	692.	0.00	41.50	0.00
.60	1436.76	0.00	124.	828.	0.00	41.50	0.00
.70	1437.21	0.00	134.	995.	0.00	41.50	0.00
.80	1437.62	0.00	144.	1159.	0.00	41.25	0.00
.90	1438.02	0.00	153.	1325.	0.00	41.25	0.00
1.00	1438.40	.10	162.	1493.	.50	41.25	0.00

D'APPOLONIA
CONSULTING ENGINEERS, INC.

C

By MB Date 5/1/81 Subject STONE LAKE DAM Sheet No. 1 of 1
Chkd. By WTC Date 5/2/81 FLOOD PEAK DISCHARGE Proj. No. 80-556

FLOOD PEAK DISCHARGE BY REGRESSION EQUATIONS

REFERENCE : HERBERT N. FLIPPO, JR. "FLOODS IN PENNSYLVANIA" WATER RESOURCES BULLETIN NO. 13, U.S. DEPT. OF THE INTERIOR, GEOLOGICAL SURVEY, OCTOBER 1977

FROM PLATE 1 OF REFERENCE, STONE LAKE DAM IS LOCATED ON FLOOD - FREQUENCY "2", BASED ON THE RECORDS OF 50 GAGING STATIONS WITH IN THIS REGION, THE FLOOD PEAK DISCHARGES, Q_T, AS SHOWN ON FIG 2 OF REFERENCE, ARE DETERMINED AS FOLLOWS

$$Q_T = C A^X \quad ; \quad \text{where } A = \text{WATERSHED AREA} = 0.58 \text{ SQ. MI.}$$

X, C = REGRESSION COEF.

FREQUENCY T-YEAR	REGRESSION COEFFICIENTS C	X	Standard Error	Q_T cfs
10	240	0.782	26% ±	157
25	349	0.765	27% ±	230
50	448	0.754	29% ±	297
100	564	0.744	31% ±	376

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CONSULTING ENGINEERS, INC.

By MB Date 4/29/81 Subject STONE LAKE DAM Sheet No. 1 of 2
Chkd. By WTC Date 4/29/81 100 YR FLOOD PEAK Proj. No. 80-556

100 YEAR FLOOD PEAK CALCULATION

REF 1: "HYDROLOGIC STUDY TROPICAL STORM AGNES", ARMY CORPS OF ENGINEERS, DEC., 1975

$$\text{LOG}(P) = \text{LOG}(Q_M) + K(P,G)S$$

WHERE

$\text{LOG}(P)$ = FLOOD PEAK IN CFS FOR A GIVEN EXCERDENCE FREQUENCY P.

$\text{LOG}(Q_M)$ = MEAN LOG OF ANNUAL FLOOD PEAKS

$$\text{LOG}(Q_M) = C_M + 0.75 \cdot \text{LOG}(A)$$

C_M = A MAP COEFFICIENT (FIG. 21, REF 1)

A = DRAINAGE AREA IN SQ. MILES

$K(P,G)$ = STANDARD DEVIATE FOR A GIVEN P AND SKEW COEFFICIENT G.

S = STANDARD DEVIATION

$$S = C_S - 0.05 \text{LOG}(A)$$

C_S = A MAP COEFFICIENT (FIG. 22, REF. 1)

G = SKEW COEFFICIENT (FIG. 23, REF. 1)

D'APPOLONIA
CONSULTING ENGINEERS, INC.

By MS Date 4/29/81 Subject STONE LAKE DAM Sheet No. 2 of 2
Chkd. By WTC Date 4/29/81 100 YR FLOOD PEAK Proj. No. 80-556

STONE LAKE DAM 100 YEAR FLOOD P = 0.01

DRAINAGE AREA = 0.58 SQ MILES
C_M = 2.13
C_S = 0.35
G = 0.20

$$\text{LOG } Q_M = 2.13 + 0.75 \text{ LOG}(0.58) = 1.95$$

$$S = 0.35 - 0.05 \text{ LOG}(0.58) = 0.36$$

FROM REF. 1, EXHIBIT 39
$K(P, G) = K(0.01, 0.20) = 2.472$

$$\text{LOG } Q_{0.01} = 1.95 + 2.472(0.36)$$

$$= 2.84$$

$$Q_{100YR} = 10^{2.84} = 690 \text{ CFS}$$

PER CORPS OF ENGINEERS MEMO, DATED 4/22/81, THE ADOPTED 100 YEAR FLOOD PEAK IS THE AVERAGE OF METHODS A AND B.

$$Q_{100} = \frac{376 + 690}{2}$$
$$= 533 \text{ CFS}$$

SAY Q_{100} = 530 CFS

APPENDIX E

PLATES

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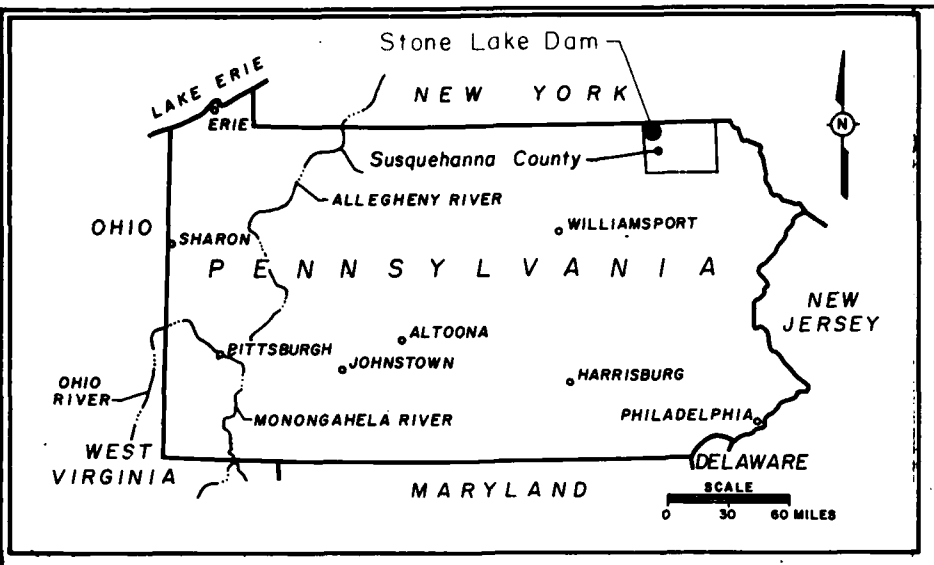
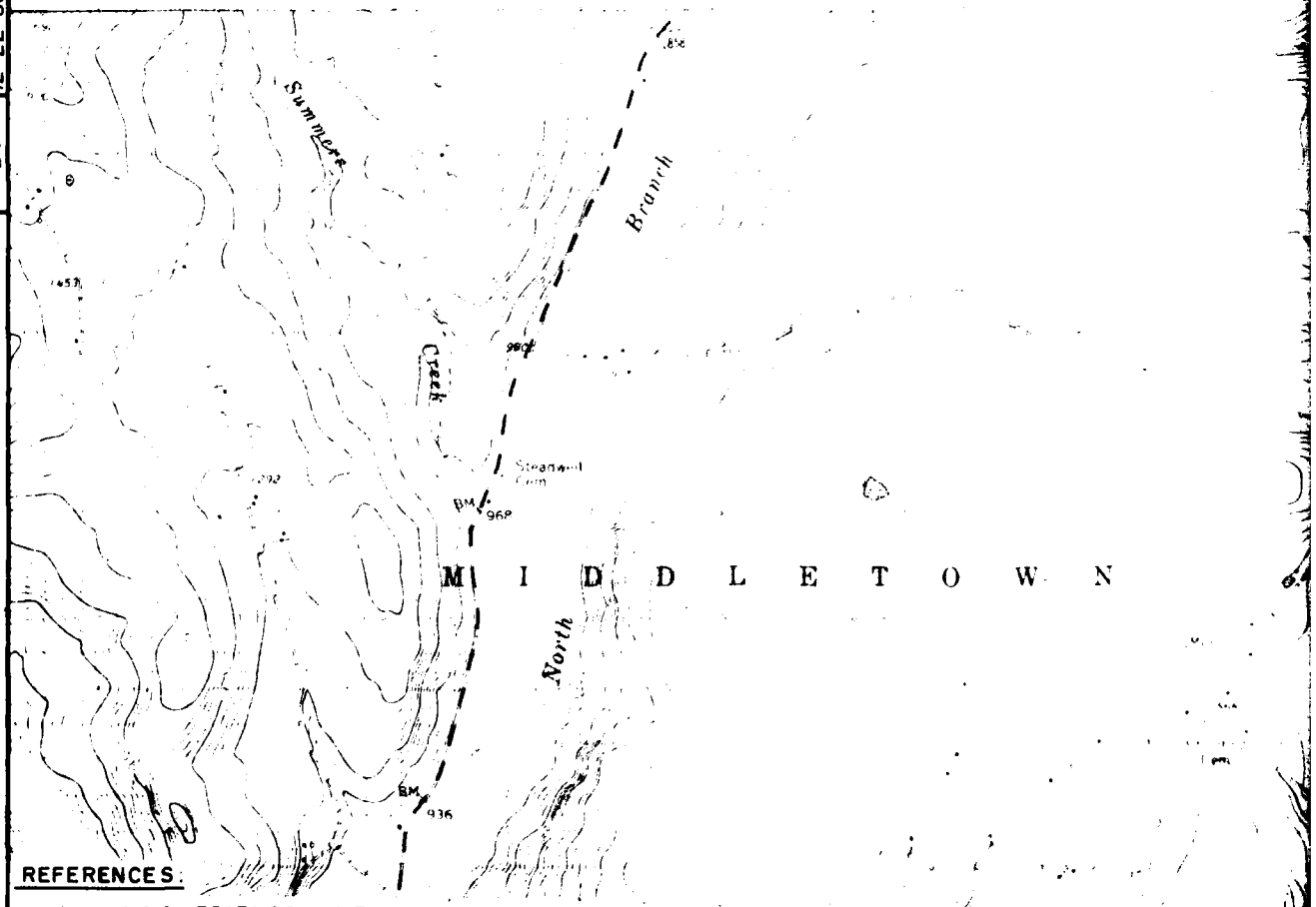
	12-22-80	APPROVED BY	JMP		4.21.81



KEY PLAN



APPR
WATER

REFERENCES:

1. U.S.G.S. FRIENDSVILLE PA-NY QUADRANGLE PHOTOREVISED 1978, SCALE: 1:24000
2. U.S.G.S. LAWTON, PA. QUADRANGLE PHOTOREVISED 1978, SCALE 1:24000

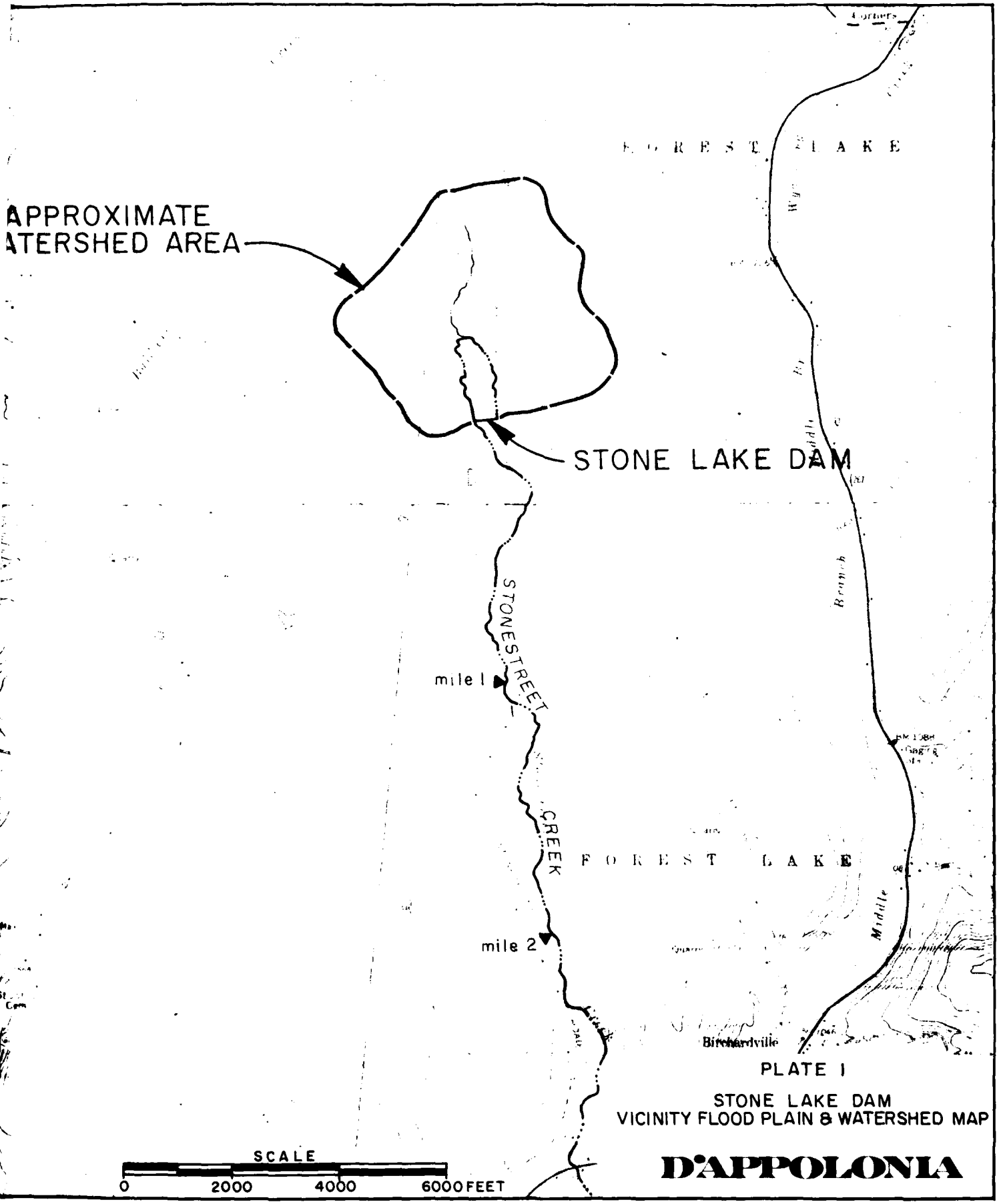


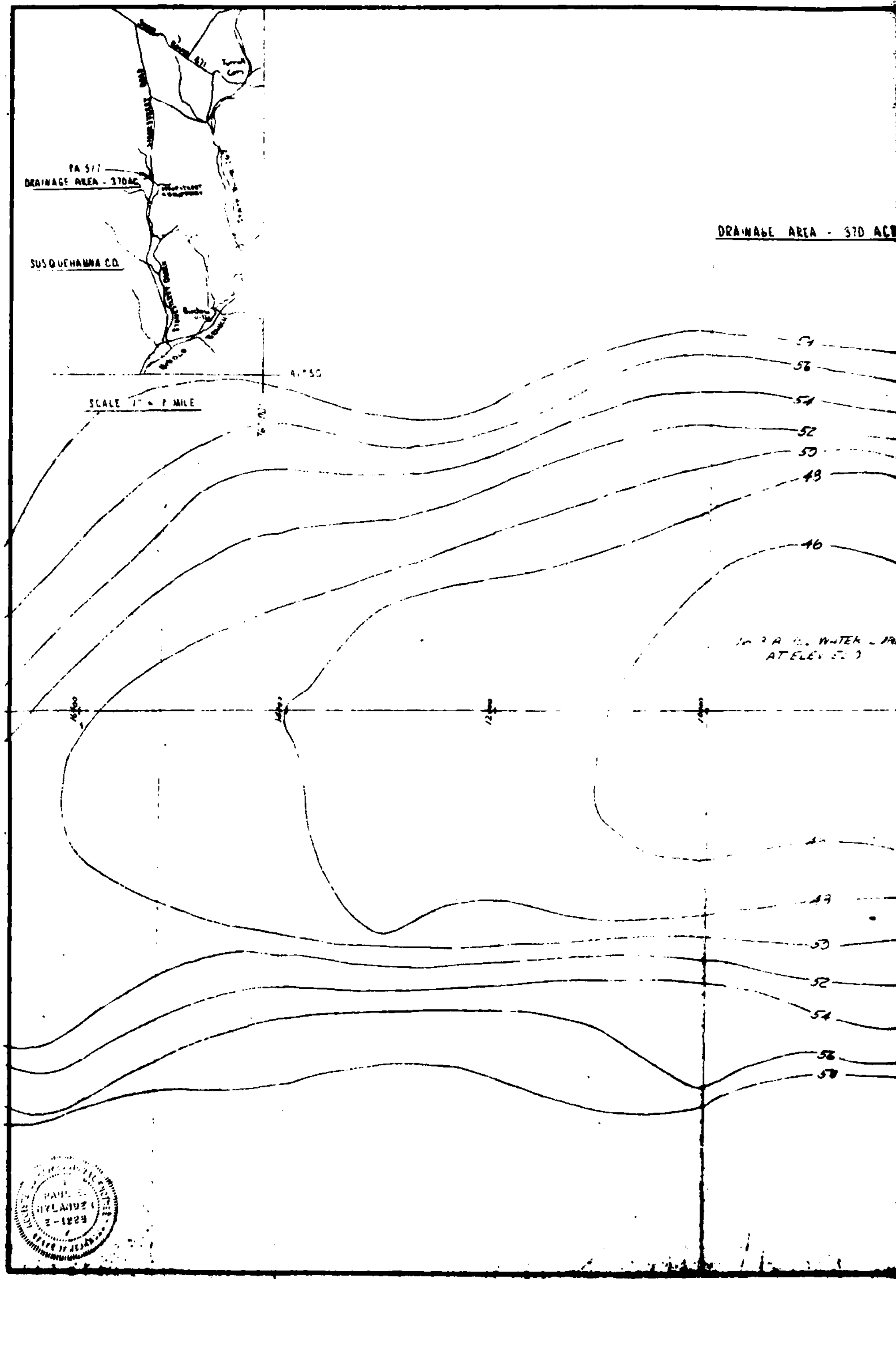
PLATE 1

STONE LAKE DAM
VICINITY FLOOD PLAIN & WATERSHED MAP

D'APPOLONIA

2

DRAWN BY	ACS	CHECKED BY		DRAWING NUMBER 80-556-B17
	4-27-81	APPROVED BY	4.28.81	



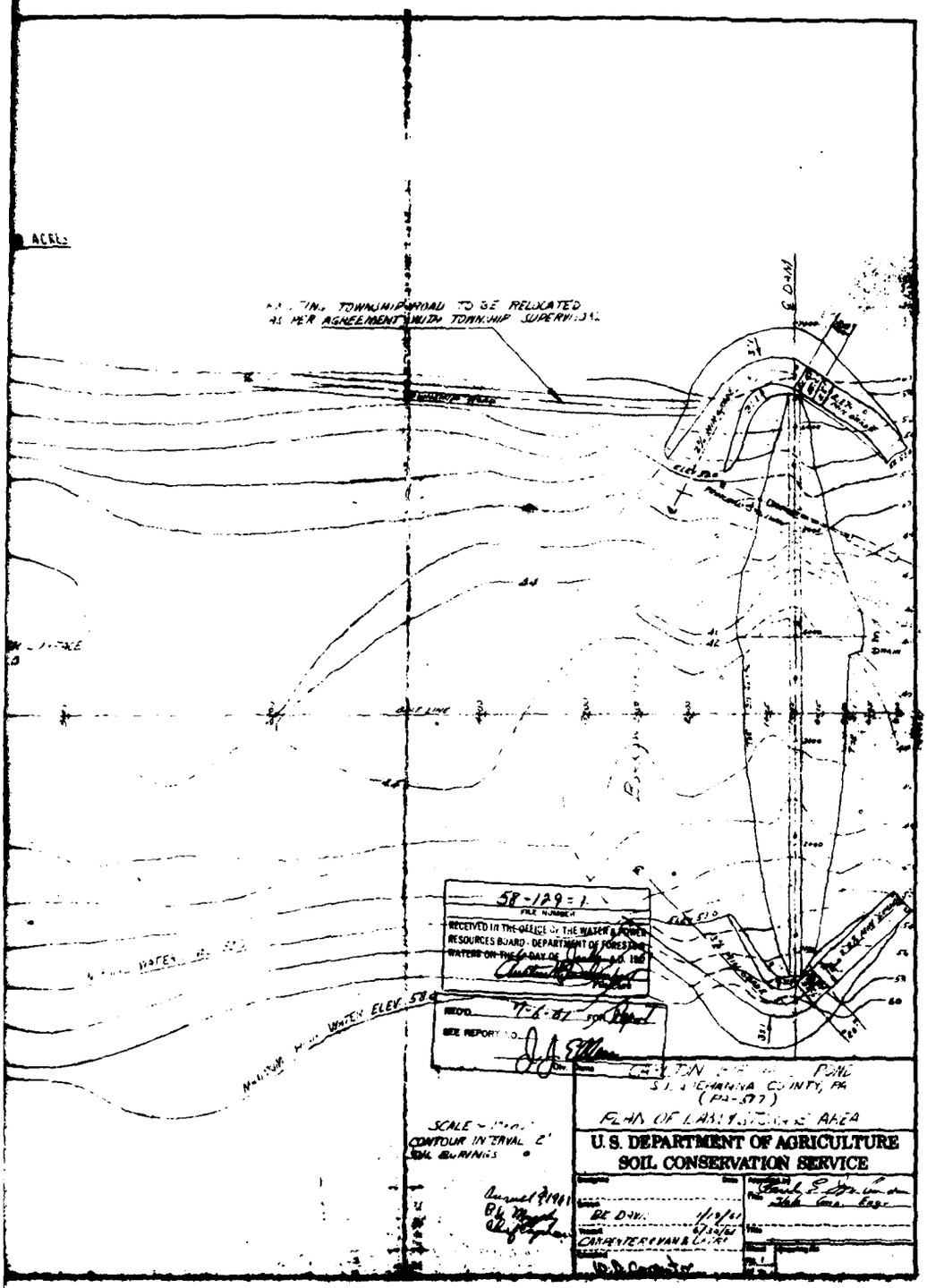


PLATE 2

D'APPOLONIA

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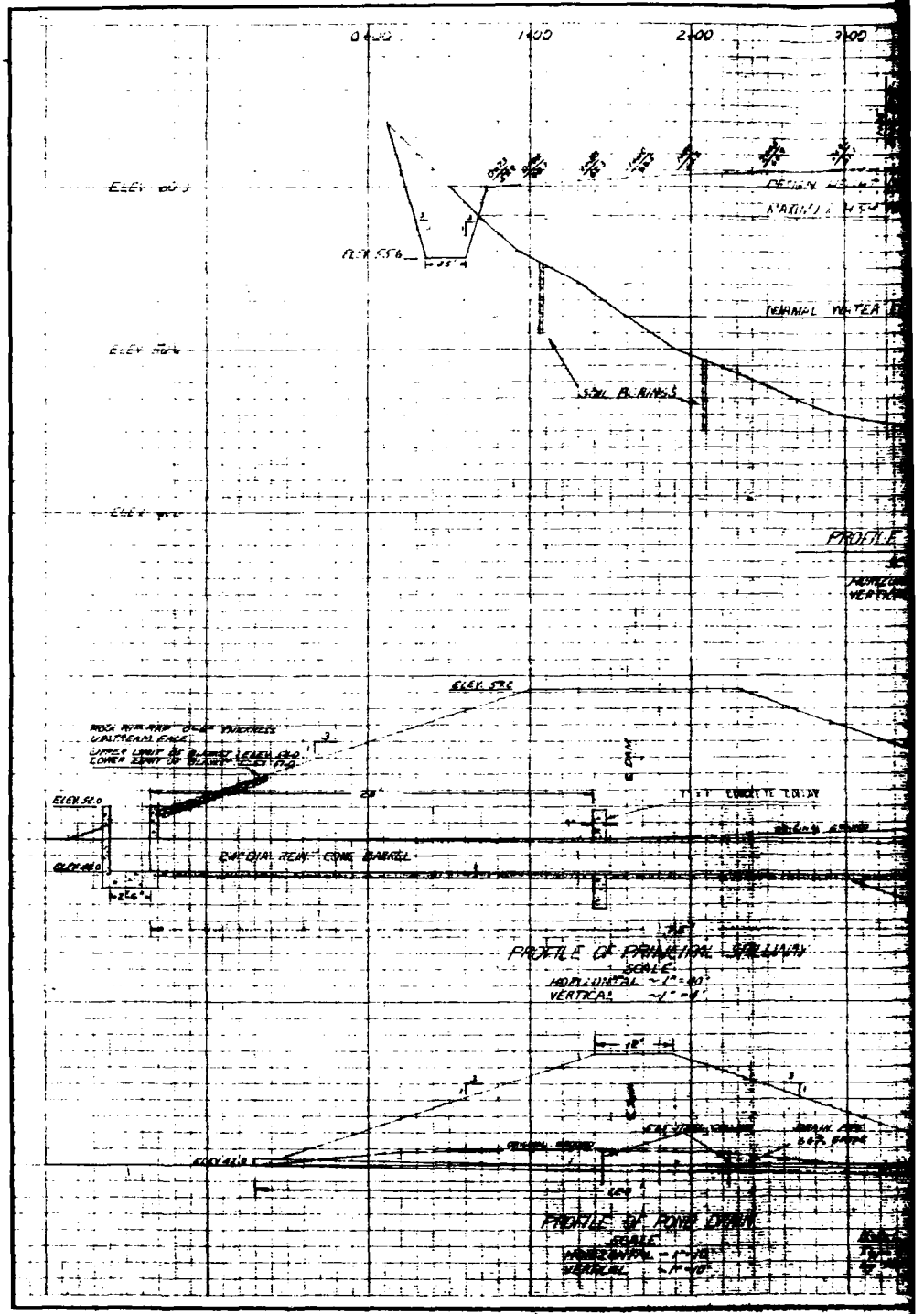
	4-27-81	APPROVED BY			



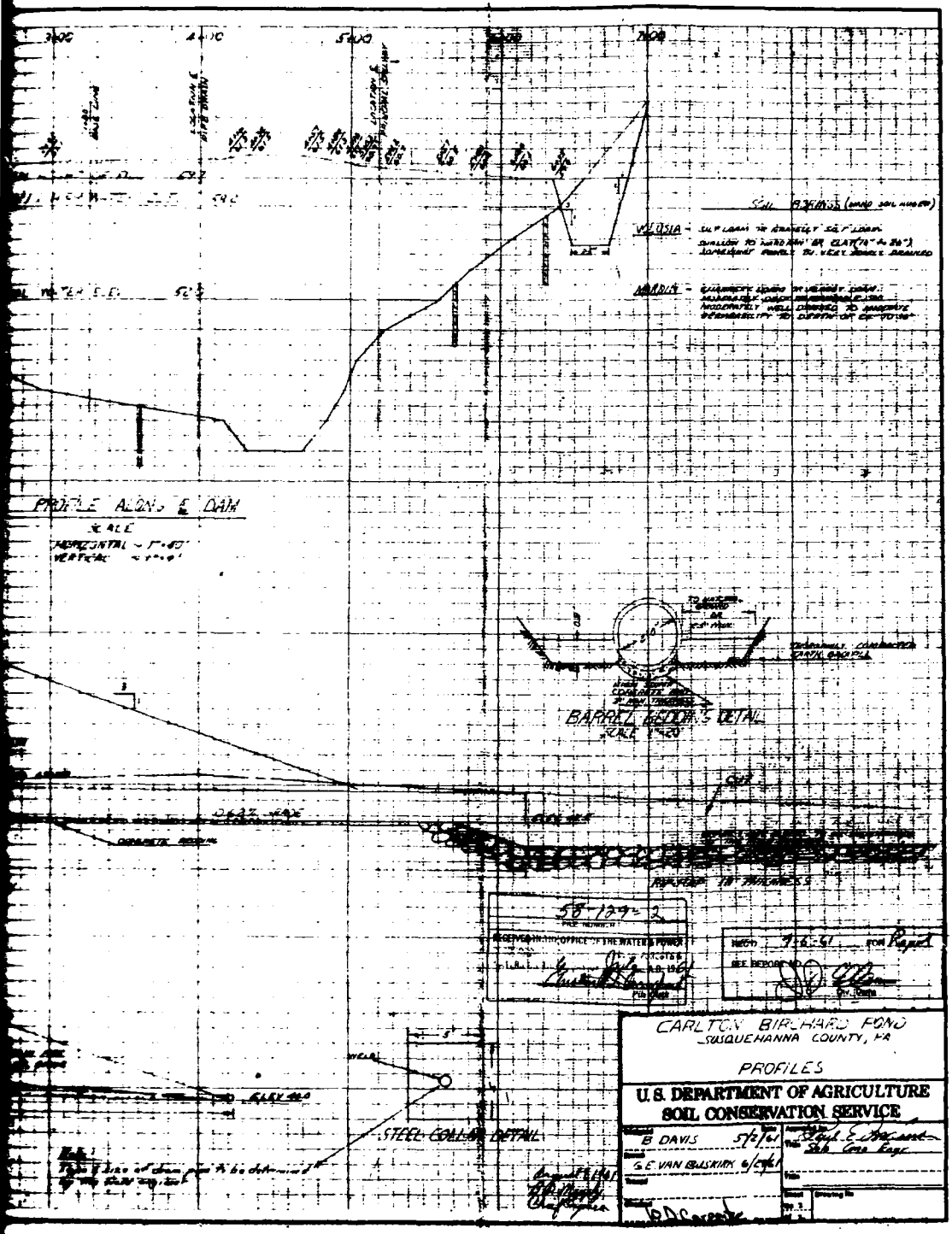


PLATE 3

D'APPOLONIA

DRAWN BY	CHECKED BY	DRAWING NUMBER
ACS 4-27-81	APPROVED BY	80-556-A25

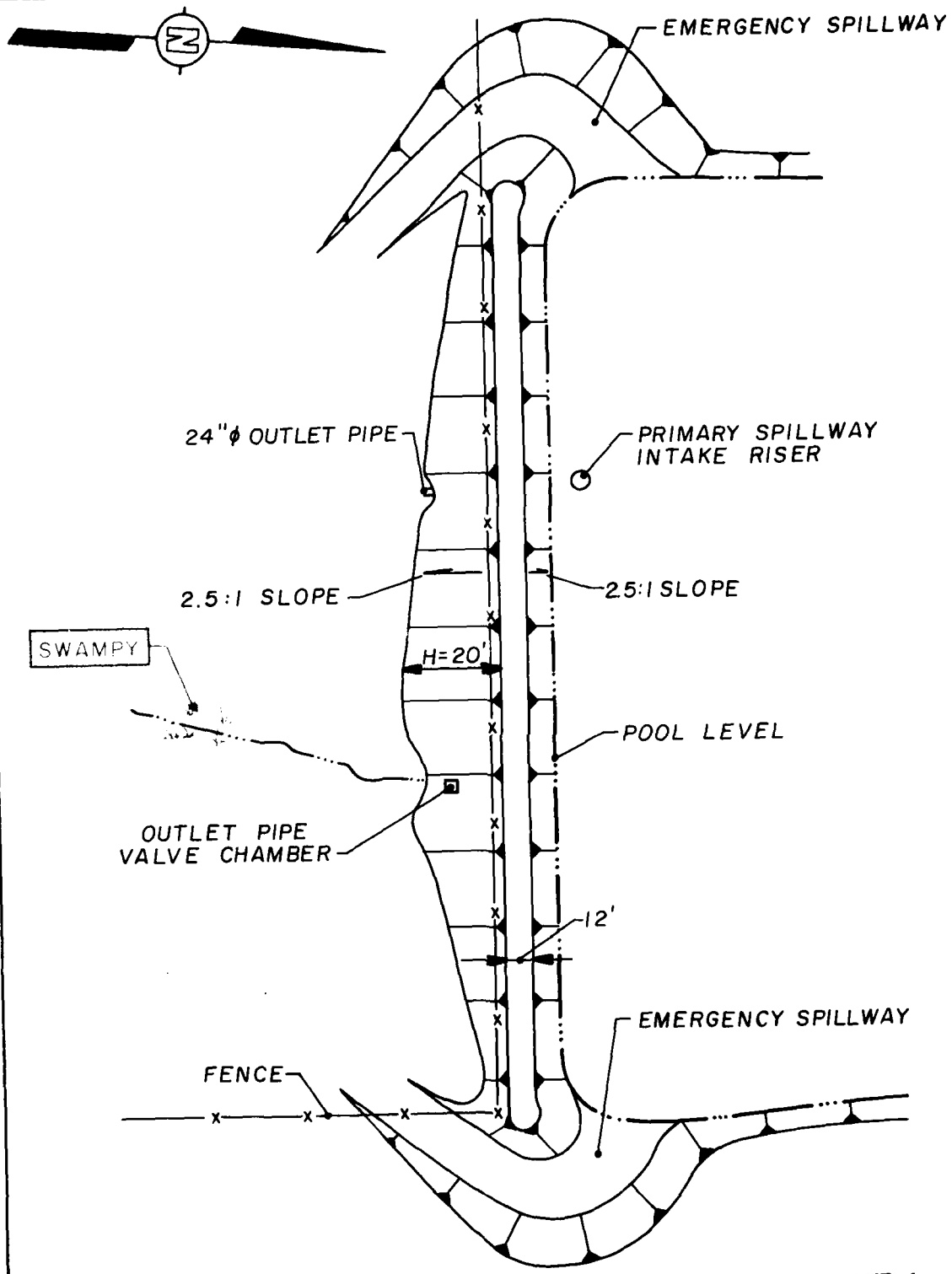


PLATE 4

STONE LAKE DAM
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE: MAR. 24, 1981

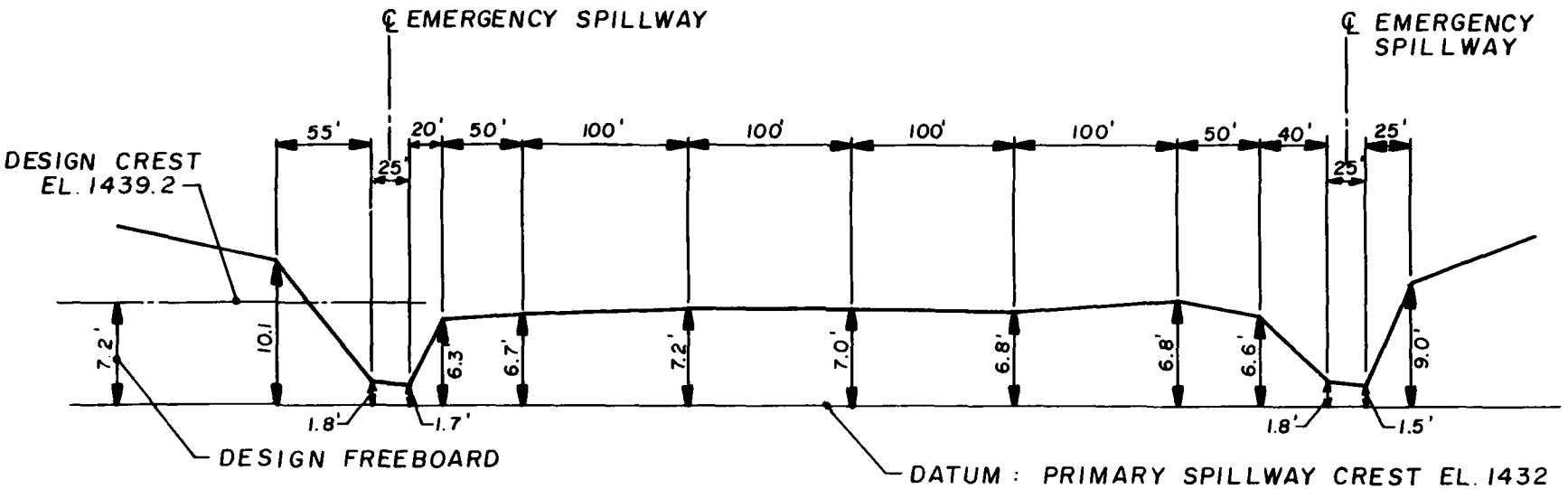
NOTE:

POOL LEVEL AT DATE OF INSPECTION AT SPILLWAY CREST.

NOT TO SCALE

D'APPOLONIA

DRAWN BY	ACS 4-27-81	CHECKED BY	RC	4/29/81	DRAWING NUMBER 80-556-A26
		APPROVED BY	JNP	4/29/81	



DAM CREST PROFILE

(LOOKING DOWNSTREAM)

NOTES :

1. DAM CREST WAS SURVEYED RELATIVE TO SPILLWAY CREST LEVEL.
2. DATUM ELEVATION PER U.S.G.S. MAP

PLATE 5

STONE LAKE DAM
DAM CREST SURVEY
FIELD INSPECTION DATE: MAR. 24, 1981

DAMPOLAND A

APPENDIX F

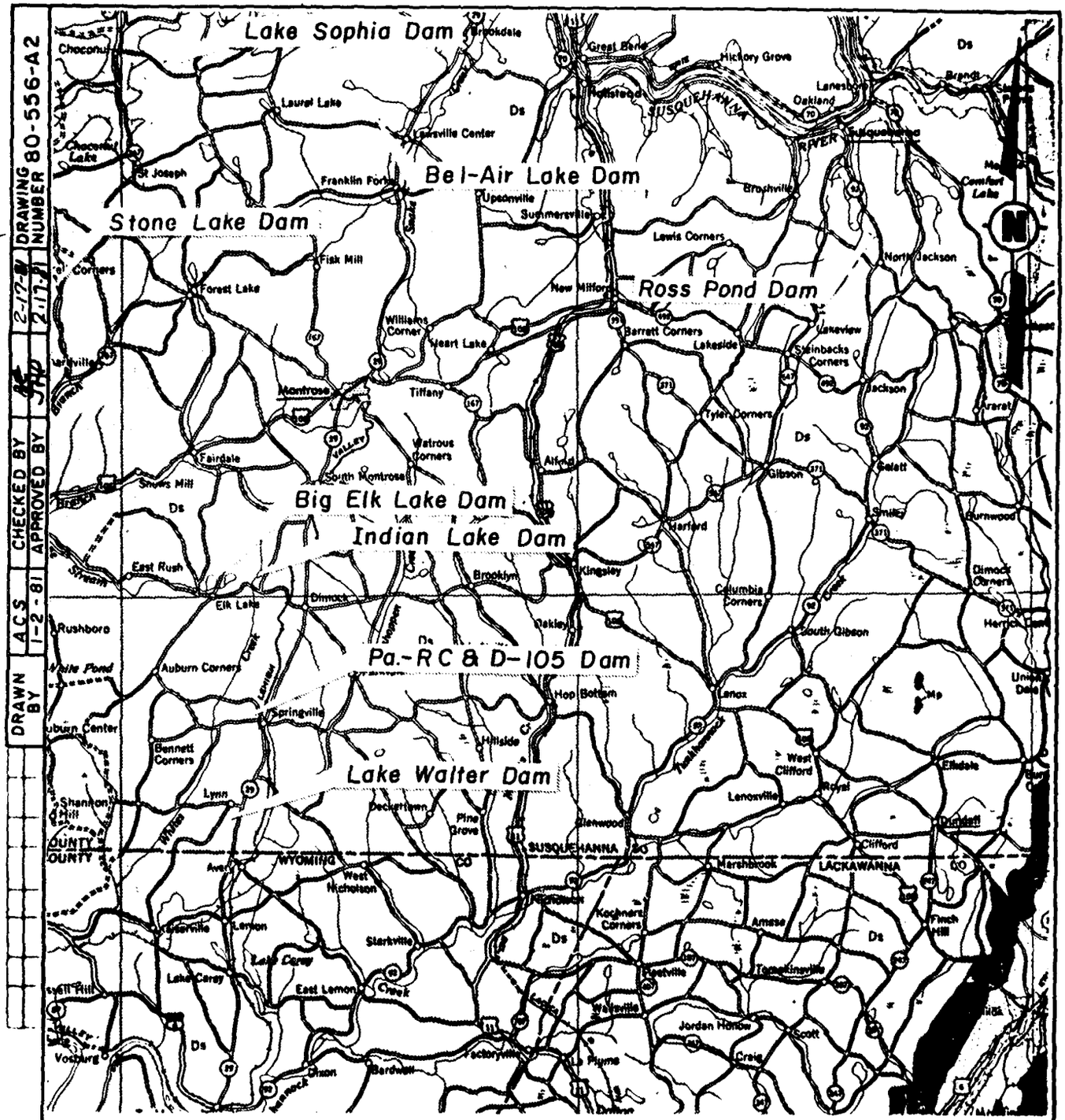
REGIONAL GEOLOGY

REGIONAL GEOLOGY
STONE LAKE DAM

The Stone Lake Dam is located in the glaciated low plateaus section of the Appalachian Plateau physiographic province, characterized as a mature glaciated plateau of moderate relief.

The geologic structure consists of a series of northeast trending folds (approximately N70°E) which plunge gently to the southwest. The dip of the limbs of the folds in the vicinity of the Stone Lake Dam is less than two degrees, with the southeast limb slightly steeper than the northwest limb. The dam is located south of the Rome Anticline and north of the Raysville Syncline. In general, the discontinuity trends are northeast and northwest.

The stratigraphy consists of glacial till which will range in thickness from very thin to approximately 200 feet. The glacial till is underlain by the Devonian Catskill Formation, which is approximately 1,800 feet thick in this area. The Catskill Formation is continental in origin, consisting of red shale and cross-bedded red and green sandstone and siltstone. The shale strata tend to weather rapidly when exposed.



DRAWING NUMBER 80-556-A2

	DRAWN BY	CHECKED BY	APPROVED BY
2-17-81	A.C.S	JHD	JHD
2-17-81	1-2-81		

GEOLOGY MAP

REFERENCE:

GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA, DEPARTMENT OF ENVIRONMENTAL RESOURCES, DATED: 1960
SCALE 1:250,000

D'APPOLONIA

19 1253 HERCULENE, A&B SMITH CO., PGH., PA 15230-1079

DRAWN BY	ACS	CHECKED BY		2-17-81	DRAWING NUMBER 80-556-A4
	1-2-81	APPROVED BY		2-17-81	

PENNSYLVANIAN

APPALACHIAN PLATEAU

Allegheny Group
Cyclic sequences of sandstone, shale, limestone and coal, numerous commercial coals, limestones thicken westward; Vanport Limestone in lower part of section; includes Freeport, Kittanning, and Clarion Formations.

Pottsville Group
Predominantly sandstones and conglomerates with thin shales and coals; some coals mineable locally.

ANTHRACITE REGION

Post-Pottsville Formations
Brown or gray sandstones and shales with some conglomerate and numerous mineable coals.

Pottsville Group
Light gray to white, coarse grained sandstones and conglomerates with some mineable coal, includes Sharp Mountain, Schuylkill, and Tumbling Run Formations.

MISSISSIPPIAN

Mauch Chunk Formation
Red shales with brown to greenish gray flaggy sandstones, includes Greenbrier Limestone in Fayette, Westmoreland, and Somerset counties, Loyalhanna Limestone at the base in southwestern Pennsylvania.

Pocono Group
Predominantly gray, hard, massive, cross-bedded conglomerate and sandstone with some shale, includes in the Appalachian Plateau Burgoon, Shenango, Cuyahoga, Cussewago, Corry, and Knapp Formations; includes part of "Oswayo" of M. L. Fuller in Potter and Tioga counties.

DEVONIAN

UPPER

CENTRAL AND EASTERN PENNSYLVANIA

Oswayo Formation
Brownish and greenish gray, fine and medium grained sandstones with some shales and scattered calcareous lenses; includes red shales which become more numerous eastward. Relation to type Oswayo not proved.

Catskill Formation
Chiefly red to brownish shales and sandstones; includes gray and greenish sandstone tongues named Elk Mountain, Honesdale, Shohola, and Delaware River in the east

Marine beds
Gray to olive brown shales, graywackes, and sandstones; contains "Chemung" beds and "Portage" beds including Burket, Brallier, Harrell, and Trimmers Rock; Tully Limestone at base.

Susquehanna Group
Barbed line is "Chemung-Catskill" contact of Second Pennsylvania Survey County reports; barbs on "Chemung" side of line.

GEOLOGY MAP LEGEND

REFERENCE:
GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA., DEPARTMENT OF ENVIRONMENTAL RESOURCES, DATED: 1960
SCALE 1:250,000

D'APPOLONIA